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IS : 9733 (Part 2) - 1989

Indian Standard (Reaffirmed 2004)

GUIDELINES FOR COMPILATION OF PERFORMANCE TESTS SCHEDULES OF COMPLETE FILLED TRANSPORT PACKAGES

PART 2 QUANTITATIVE DATA

भारतीय मानक

पूर्ण, भरे परिवहन पैकेजों की कार्यकारिता परीक्षण तालिकाओं सम्बन्धी सामान्य नियम की भारतीय मानक विशिष्टि का मसौदा

भाग 2 मात्रात्मक आंकड़े

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1989 **Price Group 7**

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards on 1 February 1989, after the draft finalized by the Transport Packages Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

This standard has been prepared in order to fulfil the need of organizations concerned with the compilation of test schedules for complete, filled transport packages.

Such test schedules can be as diverse as the journeys that packages undergo. Accordingly, this standard is intended to set guidelines for the compilation of appropriate test schedules, rather than to provide a rigid framework to be specified by regulatory or other authorities.

It is expected that, once compiled, a particular test schedule, including the test methods and intensities to be applied, could be the subject of standards or could become a matter for agreement between the parties concerned, for example, the package designer, the manufacturer of the contents, the transport authority, the customer, the statutory regulating body or any combination of them.

For international coordination, this standard is based on ISO 4180/2-1980 'Complete, filled transport packages — General rules for the compilation of performance test schedules — Part 2 Quantitative data', issued by the International Organization for Standardization (ISO).

Part 1 of this standard states the general principles entailed in compiling test schedules. The two parts are intended to be read in conjunction with one another.

Indian Standard

GUIDELINES FOR COMPILATION OF PERFORMANCE TESTS SCHEDULES OF COMPLETE FILLED TRANSPORT PACKAGES

PART 2 QUANTITATIVE DATA

1 SCOPE AND FIELD OF APPLICATION

1.1 This standard (Part 2) establishes general rules to be used for the compilation of performance test schedules for complete, filled transport packages intended for use within any distribution system, whether transported by road, rail, sea, air or inland waterway, or by a combination of these modes of transport.

1.2 It also gives the factors to be considered in assessing the criteria of acceptance of such packages after they have been subjected to a package performance test schedule.

1.3 This part incorporates all the quantitative data necessary to establish test intensities and other quantitative features of test schedules.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
IS 7028	Performance tests for complete, filled transport packages
(Part 1) : 1987	Stack tests using stacking load (*first revision*)
(Part 2) : 1988	Vibration test (*first revision*)
(Part 3) : 1987	Horizontal impact test (horizontal or inclined plane test, pendulum test) (*first revision*)
(Part 4) : 1987	Vertical impact drop tests (*first revision*)
(Part 5) : 1987	Rolling test (*first revision*)
(Part 6) : 1987	Compression test (*first revision*)
(Part 7) : 1987	Low pressure test (*first revision*)
(Part 8) : 1987	Water spray test (*first revision*)
(Part 9) : 1987	Stacking test using compression tester (*first revision*)
IS 7030 : 1973	Method for identification of parts for complete, filled transport packages
IS 7031 : 1987	Method of conditioning of complete filled transport packages (*first revision*)
IS 9733 (Part 1) : 1981	Guidelines for the compilation of performance test schedules of complete, filled transport packages: Part 1 General principles

3 FACTORS REQUIRING QUANTIFICATION IN TEST METHODS

Relevant test methods and the factors requiring quantification before each test are given in Table 1.

4 PREFERRED VALUES OF TEST INTENSITIES

4.1 Basic test intensities, which are considered to be normal for a common distribution system and which are based upon a package of 'average' mass and size (that is of mass 20 kg and dimensions 400 mm × 400 mm × 400 mm) are given in Table 2, for the road, rail, water and air modes of transport and for storage.

4.2 Where a test intensity other than the basic value is appropriate (*see* **5**), the value selected should be chosen, as far as practicable, from the preferred values given in Table 3.

4.3 For comparative investigations or research it may be necessary to select values of test intensity other than those given in Table 3.

5 TEST INTENSITY MODIFYING FACTORS

5.1 General

Guidelines for modifying basic values of test intensity, due to known features of the distribution system or of the package, are given in Table 4.

The special circumstances introduced by palletization and by the use of freight containers are outlined in **5.2**.

5.2 Modification of Test Intensity by Palletization or by the Use of Freight Containers

5.2.1 *Palletization*

Packages may be grouped into a unit load on a pallet or similar device for the whole or part of their life.

The subsequent handling of the unit load by mechanical means can change the magnitude of the hazards to which the packages are exposed, primarily vertical impact and stacking hazards.

5.2.1.1 *Vertical impact*

Manual palletization subjects the individual packages to vertical impacts of intensity similar to those sustained in loading the packages on to a road vehicle. Mechanical palletization, however, subjects the packages to a very small, if any, vertical impact hazard.

Mechanical handling of the resultant unit loads into and out of storage and in the loading and unloading of vehicles, results in the packages being subjected to a smaller vertical impact than that normally associated with the comparable manual operation (*see* Tables 2 and 4).

Palletization coupled with a suitable distribution system for handling pallets may, therefore, justify a reduction in intensity of more than one step in the preferred range of values of drop height (*see* Tables 2, 3 and 4).

TABLE 1 METHODS OF TEST AND FACTORS REQUIRING QUANTIFICATION

(*Clause* 3.1)

METHOD OF TEST	RELEVANT INDIAN STANDARD	FACTORS REQUIRING QUANTIFICATION
Conditioning	IS 7031 : 1987	Temperature, relative humidity, time, predrying conditions (if any)
Stacking test	IS 7028 (Part 1) : 1987	Load, duration of time under load, attitude(s) of the package(s)*, atmospheric temperature and relative humidity, number of replicate packages
Vertical impact test by dropping	IS 7028 (Part 4) : 1987	Drop height, attitude(s) of the package(s)*, atmospheric temperature and relative humidity, number of replicate packages, number of impacts
Horizontal impact tests inclined plane test, pendulum	IS 7028 (Part 3) : 1987	Horizontal velocity, attitude(s) of the package(s)*, atmospheric temperature and relative humidity, profiles of impacting surfaces and use (if any), of an interposed hazard, number of relicate packages
Vibration test	IS 7028 (Part 2) : 1988	Duration of test, attitude(s) of the package(s)*, atmospheric temperature and relative humidity, load (if any) superimposed on the package(s), number of replicate packages
Compression test	IS 7028 (Part 6) : 1987	Maximum load (where applicable), test attitude(s) of the package(s)*, atmospheric temperature and relative humidity, upper platen rigidly mounted or free to tilt, number of replicate packages
Low pressure test	IS 7028 (Part 7) : 1987	Pressure, duration of time at reduced pressure, temperature within test chamber, number of replicate packages
Stacking test using compresion tester	IS 7028 (Part 9) : 1987	Load applied, duration of time under load, attitude(s) of the package(s)*, atmospheric temperature and relative humidity, number of replicate packages
Wate r spray test	IS 7028 (Part 8) : 1987	Duration of time under spray, attitude(s) of the package(s)*, number of replicate packages
Rolling test	IS 7028 (Part 5) : 1987	Atmospheric temperature and relative humidity, number of replicate packages

**See* IS 7030 : 1973.

TABLE 2 BASIC TEST INTENSITIES

(*Clauses* 4.1, 5.2.1.1, 5.2.2.1 *and* 5.2.2.2)

METHODS OF TEST	VARIABLE	UNITS	TRANSPORT MODE								STORAGE	
			Road		Rail		Water		Air			
			Basic Value	Range	Basic Value	Range	Basic Value	Range	Basic Value	Range	Basic Value	Range
Test imposed by equipment installation and environment												
Climatic*	Rain Temperature Relative humidity Low pressure		Under study									
Vibration	Duration	min	20	10 to 60	20	10 to 60	Short : 20 Long : 60	10 to 60	Under study	Under study		
	Height of stack, if loaded	m	2·50	1·50 to 3·50	2·50	1·50 to 3·50	3·50	3·50 to 7·00				
Stacking	Duration	As given	1 day	1 day to 1 week	1 day	1 day to 1 week	Short : 1 day Long : 1 week	1 day to 4 weeks	1 day	Nil	Short : 1 day Long : 1 week	1 day to 4 weeks
	Height	m	2·50	1·50 to 3·50	2·50	1·50 to 2·50	3·50	3·50 to 7·00	1·80	Nil	3·50	1·50 to 7·00
Horizontal impact	Velocity	m/s	1·5	1·5 to 2·7	1·8	1·3 to 5·0	—	—	—	—	—	—
Test imposed by manpower												
Vertical impact	Drop height	mm	500	100 to 1 200	500	100 to 1 200	300	100 to 1 200	500	100 to 1 200	—	—

*Appropriate methods of test will be the subjects of future Indian Standards.

TABLE 3 PREFERRED RANGE OF TEST INTENSITIES

(*Clauses* 4.2, 4.3, 5.2.1.1, 5.2.2.1 *and* 5.2.2.2)

METHOD OF TEST	RELEVANT INDIAN STANDARD	VARIABLE	PREFERRED RANGE OF TEST INTENSITIES	
			Applicable to Normal Hazards	Applicable to Unusual or Particular Hazards
Stacking	IS 7028 (Part 1) : 1987	Load by combination of:		
		a) Height of stack	1·50-1·80-2·50-3·50-5·00-7·00 m	Range commencing at 9·00 m and continuing at 2 m intervals
		b) Density of stack	1) Identical packages: the density of the package under test	As for normal range of hazards
			2) Assorted packages: 0·25-0·35-0·5-0·7-1·0-1·4-2·0 Mg/m^3	As for normal range of hazards
		Duration under load	1-2-3 days; 1-2-3-4 weeks	Range commencing at 8 weeks and continuing at 4 weeks intervals
Horizontal impact	IS 7028 (Part 3) : 1987	Horizontal velocity	1-5-1·8-2·2-2·7-3·3-4·0-5·0 m/s	As for normal range of hazards
Vertical impact	IS 7028 (Part 4) : 1987	Drop height	100-15-200-300-400-500-600-800-1 000-1 200 mm	Range commencing at 1 500 mm and continuing at 300 mm intervals
Vibration	IS 7028 (Part 2) : 1987	Duration of test	10-20-40-60 min	Range commencing at 2 h and continuing at 1 h intervals
		Height of stack from which superimposed loads are derived	1·50-180-2·50-3·50 m	As for normal range of hazards

5.2.2 *Freight Containers*

The transport of packages in inter-modal freight containers can reduce the magnitude of certain hazards to which the packages are exposed. These are primarily vertical impact and stacking hazards and the load superimposed during vibrations.

5.2.2.1 *Vertical impact*

Manual loading of packages into a freight container subjects the packages to vertical impacts similar to those incurred in loading road vehicles. The loading of freight containers with packages made up into unit loads subjects the packages to a smaller vertical impact hazard.

Whatever changes in the mode of transport may occur (such as, the transfer of the container from road to rail, from rail to ship, then ship to road), the packages are not subjected to a further vertical impact hazard arising from loading and unloading operations and, wherever the containers are loaded and unloaded, the hazards associated with handling at the docks and into and out of ships are avoided.

The use of inter-modal freight containers may, therefore, justify a reduction in intensity of more than one step in the preferred range of values of drop height (*see* Tables 2, 3 and 4).

5.2.2.2 *Stacking*

The internal height of freight containers is approximately 2·2 m which effectively restricts the stacking height to less than 2·00 m. This is particularly important when considering the superimposed load which the package must bear in the vibration test which, for non-containerized sea transport, can be equivalent to a stacking height of 7·00 m.

The use of inter-modal freight containers may, therefore, justify the choice of a smaller stacking height than given in Table 2 (*see also* Tables 3 and 4).

6 EXAMPLES OF COMPILATION OF TEST SCHEDULES

6.1 Test Schedule 1

6.1.1 *Package and Distribution System*

The package comprises a fibreboard container (containing packets of margarine) with a mass of 25 kg and dimensions of 600 mm × 400 mm × 300 mm.

Distribution is in a temperature climate* by refrigerated road transport from manufacturer to retail outlets, the maximum distance being 500 km. Packages are formed into unit loads on pallets by the manufacturer and the unit loads are broken down to individual packages in the course of distribution by van to retail outlets. All storage is under refrigerated conditions.

6.1.2 *Tabulation of Hazards and Test Requirements*

Following the principles given in **9.2** (a) to (c) of Part 1 of this standard, hazards and testing requirements are identified as given in Table 5.

6.1.3 *Compilation of Test Schedule*

Having identified the testing requirements, the test schedule is compiled by placing the tests in the order given in Part 1 of this standard as follows:

a) Conditioning in accordance with IS 7031 : 1987 for 24 h at 5°C and 85 percent relative humidity, preceded by 24 h in a drying chamber at 23°C and 25 percent relative humidity.

b) Stacking test in accordance with IS 7028 (Part 1) : 1987 using a stacking height of 1·50 m and a stacking duration of 1 week.

c) Vertical impact test in accordance with IS 7028 (Part 4) : 1987 using a drop height of 500 mm and carrying out two tests on each package.

d) Climatic treatment (test method to be prepared).

e) Vibration test in accordance with IS 7028 (Part 2) : 1988 using a stacking height of 2·50 m and a vibration duration of 20 min.

f) Stacking test in accordance with IS 7028 (Part 1) : 1987 using a stacking height of 2·50 m and a stacking duration of 1 day.

g) Horizontal impact test in accordance with IS 7028 (Part 3) : 1987 using a velocity of 1·5 m/s.

The package attitude(s) used in the tests should be those most likely in transport.

The number of replicate packages should be determined mutually by the manufacturer and the tester. For a package made in large quantities, as in this example, a large number of packages would normally be tested in order to give a high assurance that the package and contents will withstand the hazards existing in the distribution system.

6.2 Test Schedule 2

6.2.1 *Package and Distribution System*

The package comprises a wooden case containing a machine tool and incorporates mechanical and climatic protection. It has a total mass of 2 000 kg and dimensions of 3·0 m × 2·5 m × 2·0 m.

Distribution is by road (300 km), sea (7 000 km), and rail (200 km) from Europe to West Africa.

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*For the purpose of this example, a temperature climate is considered to be one in which the temperature is unlikely to exceed 38°C or be less than − 14°C and in which the relative humidity is in the range 50 to 100 percent, as is typical of Europe.

6.2.2 *Tabulation of Hazards and Test Requirements*

Following the principles given in **9.2** (a) to (e) of Part 1 of this standard, hazards and testing requirements are identified as given in Table 6.

6.2.3 *Final Compilation of Test Schedule*

Having identified the testing requirements, the test schedule is compiled by placing the tests in the order given in IS 9733 (Part 1) : 1981 [*see* **6.2** and **9.2** (f) of that standard] as follows:

a) Conditioning in accordance with IS 7031 : 1987 for 24 h at a temperature of −18°C and (−ve) relative humidity*.

b) Stacking test in accordance with IS 7028 (Part 1) : 1987 using a stacking height of 7·00 m and a stacking duration of 1 week (the highest values of stacking height and duration encountered in combination during distribution). The package should be tested resting on face 3 (*see* IS 7030 : 1988).

c) Conditioning in accordance with IS 7031 : 1987 for 24 h at a temperature of 40°C and a relative humidity of 90 percent*.

d) Vertical impact test in accordance with IS 7028 (Part 4) : 1987 using a drop height of 200 mm (the greatest value encountered during distribution) and dropping the package on to face 3.

e) Water spray test in accordance with IS 7028 (Part 8) : 1987, using a spraying duration of 30 min and with the package resting on face 3.

f) Conditioning in accordance with IS 7031 : 1987 for 24 h at a temperature of 40°C and a relative humidity of 90 percent.

g) Vibration test in accordance with IS 7028 (Part 2) : 1988, using a height of stack of 7·00 m, a vibration duration of 60 min and with the package resting on face 3.

h) Horizontal impact test in accordance with IS 7028 (Part 3) : 1987 using a velocity of 1·8 m/s and creating impact on faces 4 and 6 while resting on face 3.

In this example, the value of the package and contents necessitates the testing of one package only, each test being carried out once.

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*The use in this example of different atmospheric conditions for stacking and vertical impact tests arises from the nature of the package, a wooden case containing a machine tool.

TABLE 4 TEST INTENSITY MODIFYING FACTORS

(*Clauses* 5.2.1.1, 5.2.2.1, 5.2.2.2 *and* 6.1)

TEST VARIABLE	TRANSPORT MODE	MODIFICATION OF TEST INTENSITY
Stacking	Road	*Vehicle Height* a) For road transport the basic stacking height of 2·50 m may be increased to 3·5 m when it is known that vehicles permitting such stacking heights may be used *Mass and Size of Package* b) The size and mass of the packages constituting the stack may introduce a limiting factor to the stack height and lead to a stack height of less than 2·50 m due to the floor loading and axle loading capabilities of the vehicles
	Rail	*Vehicle Height* a) For rail transport, the basic stacking height of 2·50 m will also be the maximum *Mass and Size of Package* b) The size and mass of the packages constituting the stack may introduce a limiting factor to the stack height and lead to a stack height of less than 2·50 m due to the floor loading capacities of the vehicles
	Water	*Vehicle Height* a) For water transport the basic stacking height of 3·50 m may be increased to 5·00 m or 7·00 m when it is known that vessels permitting such stacking height may be used *Mass and Size of Package* b) The size and mass of the packages constituting the stack may introduce a limiting factor to the stack height and lead to a stack height of less than 3·50 m due to the floor loading capabilities of the decks
	Air	Not applicable
	Storage	*Warehouses* Greater stacking heights (5·00 m, 7·00 m, or higher) may be applied when it is known that such heights may be used
	Freight containers and pallets	(*See* **5.2**)
Stacking duration	Road Rail Water Air Storage	*Known Conditions* Variation from the times given in Table 2 may be made against known facts relating to the distribution system

(*Continued*)

TABLE 4 TEST INTENSITY MODIFYING FACTORS — *Contd*

TEST VARIABLE	TRANSPORT MODE	MODIFICATION OF TEST INTENSITY
Vibration	NOTE — The effects of vibration testing will usually be manifest within the normal duration. It is desirable to extend duration of the vibration test whilst significant changes in the package or contents can be detected.	
	Road	a) *Journey Length* For road journeys between 1 000 and 1 500 km in length, the vibration duration should be 60 min. For journeys of less than 1 h, a duration of 10 min should be used. b) *Rough Journeys* For known journeys over bad roads, where poor vehicles are used or where the journey is known to be severe in some other way, the distances quoted in (a) should be halved before a decision is made concerning the duration of vibration.
	Rail	a) *Journey Length* For rail journey between 3 000 and 4 500 km in length, the vibration duration should be 40 min and for journeys longer than 4 500 km, the duration should be 60 min. For journeys of less than 3 h, a duration of 10 min should be used b) *Rough Journeys* For known journeys over poor track or where poor vehicles are used, the distances quoted in (a) should be halved before deciding whether the basic duration of vibration should be modified
	Water	(Under study)
	Air	(Under study)
Vibration stack height corresponding to superimposed load	Road	As for 'stacking height'
Horizontal impact velocity	Road	*Stowage* In known instances of bad stowage, a velocity of 2·7 m/s should be used
	Rail	*Known Conditions* The values of horizontal impact velocity in rail transport may be selected from the range 1·5 to 5·0 m/s against conditions known to obtain within a given network of railways
	Water	Not applicable
	Air	Not applicable

(*Continued*)

TABLE 4 TEST INTENSITY MODIFYING FACTORS — *Contd*

<table>
<tr><th>Test Variable</th><th>Transport Mode</th><th colspan="2">Modification of Test Intensity</th></tr>
<tr><td rowspan="17">Vertical impact, drop height</td><td></td><td colspan="2">a) <i>Mass of Package</i>
The drop height should be modified according to the package mass and mode of transport as follows:</td></tr>
<tr><td></td><td>Package Mass
kg</td><td>Drop Height
mm</td></tr>
<tr><td>Road
Rail
Air</td><td>< 10</td><td>800</td></tr>
<tr><td></td><td>10 to 20</td><td>600</td></tr>
<tr><td></td><td>20 to 30</td><td>500</td></tr>
<tr><td></td><td>30 to 40</td><td>400</td></tr>
<tr><td></td><td>40 to 50</td><td>300</td></tr>
<tr><td></td><td>50 to 100</td><td>200</td></tr>
<tr><td></td><td>> 100</td><td>100</td></tr>
<tr><td>Water</td><td>< 15</td><td>1 000</td></tr>
<tr><td></td><td>15 to 30</td><td>800</td></tr>
<tr><td></td><td>30 to 40</td><td>600</td></tr>
<tr><td></td><td>40 to 45</td><td>500</td></tr>
<tr><td></td><td>45 to 50</td><td>400</td></tr>
<tr><td></td><td>> 50</td><td>300</td></tr>
<tr><td>Road
Rail
Water
Air</td><td colspan="2">b) <i>Handling Equipment</i>
The equipment used to handle a package has to be taken into account. It is known that handling equipment is well suited to the package, a decrease in intensity will be in order; if the handling equipment is ill-suited to the package, an increase in intensity will be appropriate
Any increase or decrease in intensity should be limited to one step in the preferred range of values of drop height (<i>see</i> Table 3)
c) <i>Handleability (Size, Shape, Handling Aids) of Package</i>
The handleability of a package (depending upon its size, shape, presence of handling aids, etc) may influence the degree of hazard, packages that are difficult to handle may be subject to a reduced hazard
d) <i>Appearance (including Markings), Materials, or Construction of Package or Fragility of Contents</i>
These may require a reduction or an increase to be made in intensity. The reduction or increase should be limited to one step in the preferred range of values of drop height (<i>see</i> Table 3)
e) <i>Dangerous, Aggresive, or Valuable Contents</i>
Packages containing dangerous goods must frequently comply with various mandatory and/or statutory regulations, performance requirements or special carrier requirements and give additional assurance of the integrity of the contents. The test intensities to be used are commonly included in such requirements
Additional assurance of the integrity of the contents of the package may also be required if the contents are aggressive (for example, liable to contaminate other packages), or of high value, the test intensity should be raised accordingly</td></tr>
<tr><td>Freight containers and pallets</td><td colspan="2"><i>See</i> 5.2</td></tr>
<tr><td>Vertical impact, number of drops</td><td>Road
Rail
Water
Air</td><td colspan="2">The number of drop tests carried out at appropriate stages in the test schedule should be related to the likely incidence of vertical impact hazard in the distribution system</td></tr>
<tr><td>Attitude of package (applies to all tests)</td><td>Road
Rail
Water
Air
Storage</td><td colspan="2">The attitude in which the package is tested is determined primarily by the normal or most likely attitude of the package when exposed to the hazard concerned. If no one attitude is more common or likely, the attitude used should be that judged most likely to test the weakest parts of the package</td></tr>
</table>

TABLE 5 EXAMPLE OF TEST SCHEDULE COMPILATION — TEST SCHEDULE 1

(*Clause* 6.1.2)

ELEMENT OF DISTRIBUTION SYSTEM	HAZARD(S) CONCERNED		TEST(S)* INVOLVED		BASIC VALUE OF TEST INTENSITY	MODIFYING FACTORS	FINAL VALUE OF TEST INTENSITY
	Mechanical	Climatic Conditions	Mechanical	Conditioning Before Test or Climatic Test Required (as Appropriate)			
a) Loading of packages onto pallets, manually	Vertical impact	Temp					
b) Movement of palletized unit load to warehouse	Vibration	Temp					
c) Storage of unit loads in warehouse on pallet racking	Stacking	Refrigerated: Temp 8°C, Relative humidity 50%	Stacking	Temp 5°C, Relative humidity 85%	Stacking height: 3·50 m Stacking duration: 1 day	Pallet racking	Stacking height: 1·50 m
d) Movement of palletized unit loads from warehouse to main delivery vehicle	Vibration	Refrigerated packages in temperate conditions					
e) Transport by road (maximum distance 500 km)	Vibration	Refrigerated: Temp 8°C Relative humidity 50%	Vibration	Temp 5°C, Relative humidity 85%	Height of stack: 2·50 m Vibration duration: 20 min	Palletized unit load	Height of stack: 2·50 m Vibration duration: 20 min
	Stacking		Stacking	Temp 5°C, Relative humidity 85%	Stacking height: 2·50 m Stacking duration: 1 day		Stacking height: 2·50 m Stacking duration: 1 day
	Horizontal impact		Horizontal impact	Temp 5°C, Relative humidity 85%	Velocity: 1·5 m/s		Velocity: 1·5 m/s
	Vertical impact		Vertical impact	Temp 5°C	Drop height: 500 mm		Drop height: 100 mm
f) Movement of palletized unit loads from vehicle to warehouse	Vibration	Refrigerated packages in temperate conditions					
g) Storage in warehouse on pallet racking	Stacking	Refrigerated: Temp 8°C Relative humidity 50%	Stacking	Temp 5°C, Relative humidity 85%	Stacking height: 3·50 m Stacking duration: 1 week	Pallet racking	Stacking height: 1·50 m Stacking duration: 1 week
h) Loading of packages individually into delivery van, manually	Vertical impact	Refrigerated packages in temperate conditions	Vertical impact	Temp 5°C, Relative humidity 85%	Drop height: 500 mm		Drop height: 500 mm

(*Continued*)

TABLE 5 EXAMPLE OF TEST SCHEDULE COMPILATION — TEST SCHEDULE 1 — *Contd*

ELEMENT OF DISTRIBUTION SYSTEM	HAZARD(S) CONCERNED		TEST(S)* INVOLVED		BASIC VALUE OF TEST INTENSITY	MODIFYING FACTORS	FINAL VALUE OF TEST INTENSITY
	Mechanical	Climatic Conditions	Mechanical	Conditioning Before Test or Climatic Test Required (as Appropriate)			
j) Transport by van to retail outlet	Vibration	Refrigerated: Temp 8°C Relative humidity: 500%	Vibration	Temp 5°C, Relative humidity 85%	Height of stack: 2·50 m Vibration duration: 20 min	Short journey	Height of stack: 2·50 m Vibration duration: 10 min
	Stacking		Stacking	Temp 5°C, Relative humidity 85%	Stacking height: 2·50 m Stacking duration: 1 day		Stacking height: 2·50 m Stacking duration: 1 day
	Horizontal impact		Horizontal impact	Temp 5°C, Relative humidity 85%	Velocity: 1·5 m/s		Velocity: 1·5 m/s
k) Unloading of packages at retail outlet manually	Vertical impact	Refrigerated packages in temperate conditions	Vertical impact	Temp 5°C, Relative humidity 85%	Drop height: 500 mm		Drop height: 500 mm

*Only those hazards likely to exist at a significant level will necessitate tests.

TABLE 6 EXAMPLE OF TEST SCHEDULE COMPILATION — TEST SCHEDULE 2

(*Clause* 6.2.2)

ELEMENT OF DISTRIBUTION SYSTEM	HAZARD(S) CONCERNED		TEST(S) INVOLVED[2]		BASIC VALUE OF TEST INTENSITY	MODIFYING FACTORS	FINAL VALUE OF TEST INTENSITY
	Mechanical	Climatic Conditions[1]	Mechanical	Conditioning Before Test or Climatic Test Required (as appropriate)			
a) Storage of package in warehouse	Stacking	Temperate	Stacking	Temperature 40°C[3] Relative humidity 90%; and Temperature −18°C, relative humidity (−ve)	Stacking height: 3·50 m Stacking duration: 1 day		Stacking height: 3·50 m Stacking duration: 1 day
b) Loading of package onto road vehicle	Vertical impact	Temperate	Vertical impact	do	Drop height: 500 mm	Mass, size and handleability of package	Drop height: 100 mm according to mass of package
c) Movement of package by road to docks by covered lorry (distance 300 km)	Vibration	Temperate	Vibration	do	Height of stack: 250 m Vibration duration: 20 min	Size of package	Stacking height: Nil Vibration duration: 20 min
	Stacking		Stacking		Stacking height: 2·50 m Stacking duration: 1 day		Stacking height: Nil Stacking duration: does not apply
	Horizontal impact		Horizontal impact		Velocity: 1·5 m/s		Velocity: 1·5 m/s
d) Unloading of package at docks	Vertical impact	Temperate	Vertical impact	do	Drop height: 500 mm	Mass, size and handleability of package	Drop height: 100 mm according to mass of package
e) Storage of package in harbour warehouse	Stacking	Temperate	Stacking	do	Stacking height: 3·50 m Stacking duration: 1 week	Harbour warehouse	Stacking height: 5·00 m Stacking duration: 1 week
f) Loading of package onto ship (deep hold)	Horizontal impact	Temperate		do		Mass, size and handleability of package	
	Vertical impact		Vertical impact		Drop height: 800 mm		Drop height: 200 mm [the mass of package modifies the basic value to 300 mm and the provision of handling aids (lifting irons) reduces this to 200 mm]

g) Transport by water (sea) for a distance of 7 000 km	Vibration	Temperature 25 to 40°C, Relative humidity 40 to 100%	Vibration	Temperature 40°C, Relative humidity 90%	Height of stack: 3·50 m Vibration duration: 60 min	Long journey across ocean. Deep hold with known capacity for stacking up to a height of 7·00 m	Height of stack: 7·00 m Vibration duration: 60 min
	Stacking		Stacking		Stacking height: 3·50 m Stacking duration: 1 week		Stacking height: 7·00 m Stacking duration: 1 week
h) Unloading of package to customs shed, temporary storage *in situ*, then loading of package to open railway truck	Horizontal impact	Tropical (wet)		do		Mass, size and handleability of package	
	Vertical impact		Vertical impact		Drop height: 500 mm		Drop height: 100 mm
j) Transport by rail (distance 200 km)	Vibration	Tropical (wet)[4]	Vibration	do	Height of stack: 2·50 m Vibration duration: 20 min	Journey of less than 3 h Size of package	Height of stack: Nil Vibration duration: 10 min
	Stacking		Stacking		Stacking height: 2·50 m Stacking duration: 1 day		Stacking height: Nil Stacking duration: does not apply
	Horizontal impact		Horizontal impact		Velocity: 1·8 m/s		Velocity: 1·8 m/s
		Rainfall		Water spray	30 min total		30 min total
k) Unloading package at destination	Vertical impact	Tropical (wet)	Vertical impact	Temperature 40°C, Relative humidity 90%	Drop height: 500 mm	Mass, size and handleability of package Poor conditions at unloading site	Drop height: 150 mm (the mass and size of the package modifies the basic value of 100 mm and the poor unloading conditions increases this to 150 mm)

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1 For the purpose of this example, a temperature climate is considered to be one in which the temperature is unlikely to exceed 40°C or to be less than −14°C and the relative humidity is in the range 50 to 100% as is typical of Europe. A tropical (wet) climate is considered to be one in which the temperature is unlikely to be less than 13°C and rainfall during the year is over 1 200 mm.

2 Only those hazards likely to exists at significant level shall necessitate tests.

3 The values chosen to represent the hazard take into account the nature of the package, in this instance, a wooden case containing a machine tool.

4 Note that if the rail journey were greater in distance, it could take the package into conditions which could be described as tropical (dry) and therefore the appropriate conditions, for example a temperature of 60°C and a relative humidity of 30%, would have to be applied in addition to those for tropical (wet) conditions.

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